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WALTHAM MASS.
TELEPHONE TW 3-8700

STATINTL

June 30, 1958

[redacted]

Subject: Contract Proposal on Optical Space Filtering

Dear [redacted] STATINTL

As a result of discussions with our people during your recent visit to our laboratory you asked [redacted] to send you an informal proposal on Optical Space Filtering. [redacted] has been ill for some time and was unable to finish this proposal. I would like to apologize for the delay in forwarding this information to you.

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The possible advantages to be derived from projecting a transparency with coherent illumination and space filtering are discussed at some length in publications previously issued from this laboratory and will not be repeated here. I understand you have received copies of this material. In terms of past experience with optical space filtering problems, we are convinced that the next stage in work dealing with filtering operations in coherent light should be conducted on an experimental as opposed to a theoretical basis. In addition, we have evidence that under controlled circumstances, the system is a definite aid for viewing detail of moderate contrast which exceeds the grain size. For low contrast fine detail, on coarse grain, the results are inconclusive.

One vital point, however, that does require further investigation is the degree to which one can speak of coherence for a light wave that has passed through a photographic transparency. There is evidence at present that the thicker emulsions, due to multiple inner reflections and surface inhomogenities, so disturb the amplitude and phase of the light wave that predicted diffraction phenomenon are partially washed out. Some of these difficulties can be eliminated by properly immersing the transparency to smooth out the random phase changes. Whether or not this is a fundamental limitation on the space filtering operation is not known and can be determined only by experiment. Consequently we should move ahead to design and construct a working model of a viewer incorporating space filtering features.

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Program Outline

1. We propose to build an experimental viewer to project 20 mm x 20 mm sections of a 9" x 9" format with sufficient flexibility to allow the observer to perform selective spatial filtering while viewing. Flexibility here implies that the operator must have direct control over suppressing fluctuations due to grain on the one hand, while at the same time increasing the gradient across edges. There will, of course, be an optimum balance of these two operations which will be controlled on the basis of visual observation. The viewer will be equipped with an appropriate coherent light source and a filter consisting of an opaque circular obstruction of variable radius with an outer variable diaphragm. Similar central and outer obstructions having different but uniform transmission will also be provided. An instrument built in this way should provide a useful capability for special applications in measurement of small photographic images. We propose to deliver a breadboard instrument at the end of a six-months period.

2. We will also investigate the need for providing masks having a variable, complex transmission and phase distribution over an extremely small area. There is considerable theoretical gain from this more sophisticated approach, but the gain may be masked by practical limitations. The more simple and flexible filter system may be adequate for the job at hand.

The enclosed cost proposal is based on the issuance of a CPFF contract covering a period of six (6) months. It is further based on the assumption that the contract will not include any military specifications concerning the design or fabrication of the unit. Personnel are available to start work upon issuance of a contract.

Please feel free to call us if further information or clarification is needed.

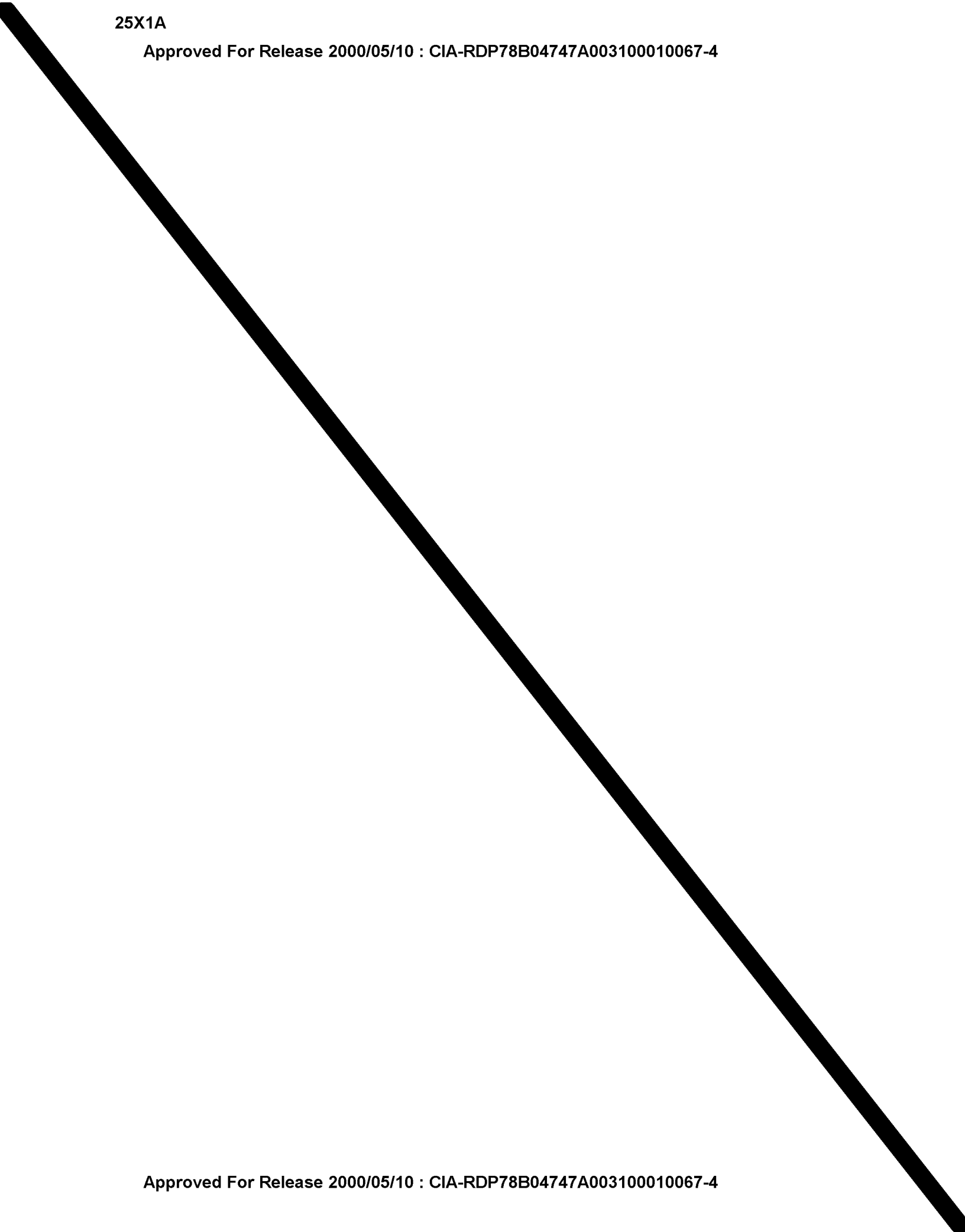
Sincerely yours,

[redacted]

STATOTHR

Vice President

Enc.
AWT/mc



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